



**DEPARTMENT OF THE AIR FORCE**

HEADQUARTERS AIR FORCE SPACE COMMAND  
PETERSON AIR FORCE BASE, COLORADO 80914-6001

71 27 Item No. 26(P, 256)  
II-26-1

9 JUN 1987

REPLY TO  
ATTN: DOG

**Transfer of Military Man in Space (MMIS) Experiment Responsibility**

**2 SWG/DO**

1. We have developed and sponsored an MMIS experiment to evaluate man's ability to do space debris belt characterization by real-time observations. A description of the experiment is at Atch 1. Now that the experiment has been approved, it must be integrated into the NASA system so that it can be flown on the Space Shuttle.

2. The experiment has been briefed and prioritized at the Air Force, DoD and STP Prioritization Boards. The NASA requirements have also been identified, and now we must define how the experiment will be structured to implement these requirements. The questionnaire from the Space Division Customer Service Office (see Atch 2) lists some of these requirements.

3. Since the foundation and priority for this experiment has been established, now the implementation process must be conducted by the AF personnel most knowledgeable of NASA Shuttle operations, which we believe are 2 SWG personnel. As the principle investigator for this experiment, the 2 SWG will have the opportunity to transition the experiment from a mere concept to an operational mission on the Shuttle by working the payload integration process.

4. Our POC, Captain Vicki Sumner, 554-5083, will be available to help transition primary responsibility for this MMIS experiment to 2 SWG.

*George C. Gibson*  
**GEORGE C. GIBSON, Lt Col, USAF**  
Acting Director, Space Sys & Activities

2 Atch  
1. MMIS Experiment  
2. CSO Questionnaire

UNITED STATES AIR FORCE



SEPTEMBER 18, 1947

FILE NUMBER

9

AF

III-26-2

# **SPACE DEBRIS BELT CHARACTERIZATION / MAPPING BY REAL-TIME OBSERVATIONS**

**AFSPACECOM-704**

## **CONCEPT**

### **● OBJECTIVE**

- **TO EVALUATE THE POTENTIAL FOR OPERATIONAL CHARACTERIZATION BY MAN OF SPACE OBJECTS FROM LOW EARTH ORBIT**
  - **CHARACTERIZE DEBRIS BELTS**
  - **ASSESS FEASIBILITY OF MANNED OBSERVATIONS FROM SPACE**
  - **COMPARE VISUAL AND REMOTE SENSOR OBSERVATIONS**
  - **EVALUATE POTENTIAL EARLY WARNING CAPABILITIES TO IDENTIFY SPACE-BASED THREATS TARGETED AGAINST U.S. GROUND- OR SPACE-BASED ASSETS**

### **● DESCRIPTION**

- **CREW MEMBER WILL OBSERVE, IDENTIFY, PHOTOGRAPH AND RECORD OBSERVATIONS OF ORBITING SPACE OBJECTS FROM SHUTTLE WINDOWS USING LOOK ANGLE PREDICTIONS AND HANDHELD EQUIPMENT:**
  - **HIGH-POWERED, HIGH RESOLUTION BINOCULARS**
  - **70 MM HASSELBLAD CAMERA WITH A 250 MM OR 500 MM TELEPHOTO LENS**

Atch 1

**SPACE DEBRIS BELT MAPPING CONCEPT**  
**AFSPACECOM-704**

**JUSTIFICATION**

● **MILITARY RELEVANCE**

- **SUPPORTS SPACE SURVEILLANCE REQUIREMENTS**
- **GATHERING OF REAL-TIME OBSERVATION DATA TO:**
  - **DETERMINE RELEVANCY OF NON-U.S. ORBITING SPACE OBJECTS TO NATIONAL SECURITY POSTURE**
  - **PROVIDE UPDATED OBJECT IDENTIFICATION TO MAINTAIN CURRENT ACCOUNTABILITY**
  - **SUPPORT EFFORTS OF SIGNATURE DATA PROCESSING (SDP) DEVELOPMENT**
- **CHARACTERIZE DEBRIS BELTS FOR IMPACT ON MANNED AND UNMANNED SPACECRAFT**
- **VERIFY THE ACCURACY OF PREDICTING SHUTTLE COLLISIONS USING CMC-PROVIDED COMBO RUNS**

● **MANNED REQUIREMENTS**

- **DOD ASTRONAUT WILL SUPPORT SEVERAL "TARGETS OF OPPORTUNITY" AT SCHEDULED TIMES**

● **COMPARISON TO ALTERNATIVES**

- **CURRENT CAPABILITIES DEPEND ON EARTH-BASED RADAR RETURN SIGNATURES AND OPTICAL OBSERVATIONS**
- **REAL-TIME IDENTIFICATION OF UNKNOWN TARGETS MAY NOT BE POSSIBLE WITH CURRENT CAPABILITIES**

● **PRIORITY**

- **AF RANKING 1/11**

- **DoD RANKING 5/15**

● **STATUS**

- **ANTICIPATED FUNDING BY AFSPACECOM WILL BE MINIMAL**
- **"LAUNCH READY" 3RD QUARTER OF CY 1989**

**EXPERIMENT/PAYLOAD QUESTIONNAIRE**

**1. Management**

Space Flight Request \_\_\_\_\_

Title:

As of Date \_\_\_\_\_

Acronym:

Payload Status \_\_\_\_\_

DD-1721 No/Date

Sponsor (Org., Address, Phone)

SD Project Officer (Org., Phone)

Principal Investigator  
(Org., Address, Phone)

Funding Sources  
(Program Element, Org)

Prior IAAP Current FX FXe1 FXe2

- . Experiment Develop
- . Data Reduction
- . Data Dissemination

Security Classification

- . Hardware
- . Software
- . Data

Delivery Schedules (include availability dates)

- . Hardware
- . Software
- . Test Plans
- . Parts & Materials List

Other Key Personnel (Name, title, organization, mailing & TWX address, phone numbers)

- . Project Director
- . Field Representatives

Atch 6

- . Data Recipients
- . Data Analysts
- . Affiliated Organizations
- . Contractors

## 2. EXPERIMENT DESCRIPTION

Functional description of experiment:

Drawings: external, mounting, special access

Specifications

Other documents

## 3. LAUNCH AND ORBIT REQUIREMENTS

Orbital parameters (apogee, perigee, inclination, eccentricity)

Stationkeeping

Launch window

On-orbit life

Special earth, sun, moon, star position requirements/limitations

Other

## 4. ON-ORBIT REQUIREMENTS

Attitude stabilization/rates

Minimal lock direction

Excursion limits and rates

Deployment (asparation/erection)

On-orbit timeline, duty cycle

Flight crew number operations (see section 16.)

Other

## 5. PHYSICAL DESCRIPTION

## **Item Identification**

**Design criteria**

**Dimensions (stowed/deployed) - drawings**

**Field of view**

**Mounting requirements - preferred orientation**

**Maximum excursion of moving parts**

**Momentum unbalances (define for each moving item)**

**Mechanical access requirements**

**Weight - cg - moments of inertia (extreme values)**

- At launch

- Variations during mission

**Electrical connections: locations, types**

**Connector pin assignments**

**Wiring requirements (plug and pin lists)**

**Erection/deployment requirements**

**Alignment requirements**

## **6. ELECTRICAL POWER REQUIREMENTS**

**Voltage - current - power - energy**

- Standby, warmup, operational, surge

**Surge current loads/durations**

**Power and power ground isolation**

**Duty cycle**

**Energy requirements/day on orbit**

## **7. ELECTRICAL CHARACTERISTICS**

**Power controls (external and internal)**

**Atch 6**

Power line filters - description

High voltage (over 100 V) sources

EMI emanation/susceptibility

- Requirements - test plans - test data

Shielding requirements/provisions

Magnetic fields - limits - generation

## 8. DATA HANDLING

Experiment data outputs

Health and status (housekeeping) requirements

Signal characteristics (binary - analog - data stream)

Impedance

Bandwidth-bits/seconds

Timing signal requirements

Data/program storage requirements

## 9. COMMAND AND CONTROL

Commands required: type and number

Electrical characteristics of required commands

Command rates - duty cycle

Special requirements

## 10. THERMAL CONTROL

Temperature limits

- Preferred, maximum operational, nonoperational, storage

Internal power dissipation

Thermal restrictions

Thermal mass

**Thermal model**

**11. STRUCTURAL**

Structural design criteria

Structural test plans - test results

Structural/dynamic models

Fracture control/stress corrosion control plans (Shuttle only)

**12. INSIDE/CARGO HANDLING**

Summary of testing planned/completed

- Functional, structural, dynamics, environmental, EMC, thermal, safety

Provide summary of available test results

Testing required after experiment delivery:

- At integration contractor facility
- At launch site
- After retrieval (if applicable)

Define ground support (including equipment) needed

Test procedures/data reduction description

Go, no-go criteria

Special handling requirements

Field servicing

Cleanliness requirements

Postflight requirements (Shuttle only)

**13. POTENTIAL HAZARDOUS ITEMS**

Pressure systems (liquid or gas)

Ordnance systems

Propellant systems



**Ionization radiation sources**

**Plans to secure compliance to RD safety requirements**

**Other**

**12. SPECIAL REQUIREMENTS**

**Ascent/en-orbit reentry trajectory parameters**

**On-orbit stationkeeping**

**Accuracy of ephemeris data**

**Photographic coverage**

**Weatherological services**

**13. ORBITAL DATA REQUIREMENTS**

**Ephemeris - knowledge/prediction (real time versus postflight)**

**Real time experiment data**

**Attitude and attitude rates**

**Orbital timelines**

**Sun, earth, moon, star positions**

**Other**

**14. FLIGHT CREW PARTICIPATION (SHUTTLE ONLY)**

**Aft Flight Deck experiments**

**Experiment operation/monitoring**

**Photographic closed circuit television coverage**

**Real time data evaluation**

**Extravehicular activity**

**Flight crew timelines**

**Flight crew training**

**Use of remote manipulator system**